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Mazdoor Kisan Shakti Sangathan

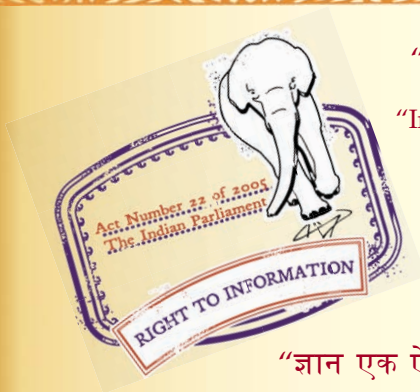
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Jawaharlal Nehru

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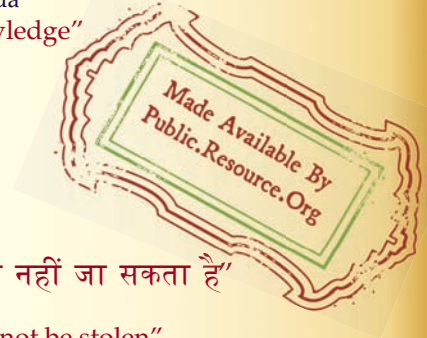
IS 10498 (1983): Apparatus for determining permeability of foundry sand [MTD 14: Foundry]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

SPECIFICATION FOR
APPARATUS FOR DETERMINING
PERMEABILITY OF FOUNDRY SANDS

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR APPARATUS FOR DETERMINING PERMEABILITY OF FOUNDRY SANDS

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Indian Standard

SPECIFICATION FOR APPARATUS FOR DETERMINING PERMEABILITY OF FOUNDRY SANDS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 21 February 1983, after the draft finalized by the Foundry Sectional Committee had been approved by the Structural and Metals Division Council.

0.2 Permeability is a physical property of the moulded mass of sand mixture which allows air to pass through it. It is one of the most important properties affecting the characteristics of moulds and cores and thereby the quality of castings produced.

0.3 In view of the importance of the permeability in moulded mass mixtures, it is very essential to have standard equipment to measure the permeability. This standard has been formulated in order to help foundries, so that they may make use of good quality equipments available in the country.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements for permeability apparatus used for determining the following:

- a) Base permeability,
- b) Green permeability, and
- c) Dry permeability of sands.

*Rules for rounding off numerical values (*revised*).

2. SUPPLY OF MATERIAL

2.1 General requirements relating to the supply of permeability apparatus shall be as laid down in IS : 1918-1966*.

3. CONSTRUCTIONAL REQUIREMENTS

3.1 The apparatus used for determining permeability of sand shall consist of the following:

3.1.1 *Water Tank* — The tank shall be cylindrical and of non-corrosive material. The tank shall have water level mark easily visible from outside. The tank shall have an air tube of non-corrosive material at the centre.

3.1.2 *Air Tank* — The tank shall be cylindrical and of the non-corrosive material. The diameter of air tube at the centre of the air tank shall be slightly bigger than that of the tube in the water tank and shall be of non-corrosive metal. The air tank shall be balanced so that it shall slide freely when placed inverted in the water tank. Air volume in the floating position of the air tank shall be 2 000 ml. The air tank shall be calibrated and marked as 0, 1 000 and 2 000 ml of air and shall be visible to the user. The mass of the air tank shall be adjusted to give 10 cm water pressure when total air is passed to the manometer. The valve system in the air passage shall be leak-proof.

3.1.3 *Mercury Sealing Cup* — The cup shall be designed to accommodate the specimen tube in sufficiently dipped condition and shall also be provided with a drain plug to remove mercury, as and when required.

3.1.4 *Rubber Sealing Device (Alternate to Mercury Sealing Cup)* — It shall have the rubber bush and shall be sufficiently soft to hold the specimen tube, air tight when placed over it. Rubber bush shall be of water resistant material.

3.1.5 *Manometer* — The manometer shall consist of glass tube of uniform inside diameter, water reservoir and 0 to 10 cm scale. The reservoir shall have the following four connections:

- a) Stop-cock for pouring water in the reservoir,
- b) Stop-cock for draining the reservoir and also for adjustment of zero of the water level inside the manometer tube,
- c) Tube from manometer. The glass tube shall be firmly fixed to avoid any leak, and
- d) Mercury sealing cup or rubber device.

*Methods of physical tests for foundry sands.

3.1.6 The results obtained on any of the permeability meters shall be within ± 10 percent of the divisions and permeability number shall be comparable with formula given below:

$$N = \frac{v \times h}{P \times a \times t}$$

where

N = permeability number,

v = volume of air in ml passed through the test specimen,

h = height of test specimen in cm,

P = pressure of air in cm of water,

a = area of cross-section of specimen in cm^2 , and

t = time in minutes.

3.1.7 Air Pressure Gauge — It shall be capable of showing the pressure equivalent to 10 cm water column pressure and shall be graduated in 100 division to read direct permeability number for 1.5 cm and 0.5 cm orifice. Separate marking on the dial shall indicate the results by the respective orifices.

3.2 Accessory for Obtaining Dry Permeability

3.2.1 Mercury Sealing Accessory — The standard specimen shall be obtained through split specimen tube. The sample shall be baked and inserted in the accessory and clamped from the top. For weaker sand sample, steel ring shall be used in the bottom while rimming the sample. Sufficient mercury shall be poured around the specimen to seal any air passing through the sides. Permeability shall be measured as usual by placing the accessory in the orifice cup.

3.2.2 Rubber Sealing Accessory — In this, mercury shall be dispensed with the rubber sealing device. Standard specimen obtained through split specimen tube shall be baked and shall be inserted in the tube. Air shall be pumped through the valve to seal the specimen. Permeability shall be measured as usual by placing the accessory in the orifice cup. For weaker sand samples steel ring shall be used in bottom of the specimen.

4. TYPES OF INSTRUMENTS AND THEIR OPERATIONS

4.1 Permeability of sand in a foundry is generally determined by one of the following methods.

4.1.1 Apparatus A — It consists of water tank, inverted air tank, manometer, mercury sealing cup, standard orifices of 1.5 and 0.5 mm, standard specimen tube and permeability chart. Standard rammed sample with the specimen tube is placed in the mercury cup after preloading of the apparatus and air is released through the orifice. Manometer reading will give the direct pressure in centimeters. Permeability number is found from the chart provided, or with a movable dial suitably placed to read the permeability number directly.

4.1.2 Apparatus B — It consists of same components as in **4.1.1** except in place of mercury cup a rubber air seal device is provided. Standard rammed sample with the specimen tube is placed tightly on the rubber air seal device after preloading of the apparatus. Remaining operations are same as mentioned in **4.1.1**.

4.1.3 Apparatus C — It consists of water tank, inverted air tank, air pressure meter with direct reading calibrated scale, specimen tube, rubber sealing device and standard orifices of 1.5 and 0.5 mm. Operations are same as in **4.1.1** and **4.1.2** except the pressure meter, will show the direct permeability number and water column pressure.

4.1.4 Apparatus D — It consists of rubber air sealing device, orifices of 1.5 and 0.5 mm pressure meter with calibrated permeability number scale, electrically operated motorised blower set for uniform air pressure and air flow regulating device along with other accessories as in **4.1.3**, with additional accessory for direct mould tester with rubber faced contact head linked with rubber tubing to an adopter which fits in the rubber air sealing device. Operations are same as in **4.1.3**. The apparatus is loaded by connecting to a suitable electric supply and pressure meter is regulated equivalent to 10 centimeters water column pressure. This apparatus is useful to measure permeability of cores and moulds on the shop floor as well as standard sand specimen in the laboratory.

5. PACKING AND SUPPLY

5.1 The apparatus shall be supplied in suitable packing to avoid damage in transit.

6. MARKING

6.1 Each permeability meter shall be marked with the manufacturer's name or the trade-mark.

6.1.1 The permeability meter may also be marked with the ISI Certification mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

QUANTITY	UNIT	SYMBOL
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

QUANTITY	UNIT	SYMBOL
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

QUANTITY	UNIT	SYMBOL	DEFINITION
Force	newton	N	1 N = 1 kg.m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²